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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/528,362	03/18/2005	Teiji Suzuki	4379-0176PUS1	5029

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EXAMINER	
YANG, JIE	

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
11/28/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/528,362	SUZUKI ET AL.	
	Examiner	Art Unit	
	Jie Yang	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) *7-11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/18/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election of "Group I—Claims 1-6, drawn to a method of nitriding a metal ring made of maraging steel" in the reply filed on 10/29/2007 is acknowledged without traverse (MPEP 818.03(a)).

Claims 7-11 are withdrawn from consideration as being directed to a non-elected group and claims 1-6 are pending for examination.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tahara et al (US 4,975,147, thereafter, '147).

Regarding claims 1 and 3, '147 teaches a method of pre-treating metallic articles or works for the purpose of cleaning and activating the surface prior to nitriding and related nitriding process (Col.1, lines 5-12; Col.5, lines 4-68 of

'417). '147 does not specify that the metallic article of '147 is a maraging steel ring as claimed. However, the metallic articles of '147 are broad enough to include the metal ring made of maraging steel. It would have been obvious to one skilled in the art that the nitriding method of '147 would be appliable to any metallic articles including the claimed maraging steel ring.

'147 teaches a fluorine- or fluoride-containing gas is introduced into the heated furnace, whereby the oxidized layer on the metallic work surface is removed and a fluorinated layer is formed on said surface, which reads on heating the steel in the presence of a halogen compound gas, so as to eliminate an oxide film from the surface of the metal ring and to form a halogenous compound film as claimed in the instant claims 1 and 3. '147 teaches eliminating the fluorinated layer by vacuum, heating the metallic works and blowing a mixture gas composed of N_2 and H_2 (Col.5, lines 4-36 of '147), which reads on heating the metal ring on which said halogenous compound film is formed under a vacuum or reduced pressure atmosphere, so as to eliminate said halogenous compound film as claimed in the instant claim 1. '147 further teaches a nitriding process with heating in the presence of an ammonia gas (Col.6, lines 47-57 of

'147), which reads on the nitriding process as claimed in the instant claim 1.

Regarding claim 2, '147 teaches eliminating the fluorinated layer by vacuum, heating the metallic works and blowing a mixture gas composed of N_2 and H_2 at a temperature range from 480°C to 700°C, which overlaps the temperature ranging from 450°C to 490°C as claimed in the instant claim. '147 does not explicitly state the heating period is from 5 to 10 min. However, heating time period is result-effective variable in term of eliminating the halogenous film, which is evidenced by '147. '147 teaches the fluorinated layer may be eliminated simultaneously with a thermal treatment (Col.5, lines 4-36 of '147) and '147 shows examples for heating 10 or 30 min. prior to nitriding (Col. 6, lines 33-57; Col.7, lines 29-63 of '147), which overlaps the heating time period as claimed in the instant claim. Therefore, it would have been obvious to one skilled in the art to have optimized heating time period, for example, for 5 to 10 min. prior to nitriding process as claimed in the instant claim in order to effectively eliminate the halogenous film. See MPEP 2144.05 II.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over '147 as applied on claims 1-3, and in view of Imai et al (US 6,631,542 B1, thereafter '542).

Regarding claim 4, '147 teaches performing nitriding under a temperature range of 480 to 700°C with NH3 or a mixed gas composed of NH3, which overlap the nitriding temperature range as claimed in the instant claim (refer to the rejections for claims 1 and 3). But '147 does not explicitly state processing time ranging from 30 to 120 min. However, nitriding temperature and time are recognized as result-effective variables in term of thickness of nitride film, which is evidenced by '542. '542 teaches nitriding maraging steel rings at a temperature range of 450°C to 500°C for 30 to 120 min. (Claims 1 and 7 of '542), which has same nitriding temperature and time ranges as claimed in the instant claim. Therefore, it would have been obvious to one skilled in the art to have optimized nitriding temperature and time, for example, 450°C to 500°C for 30 to 120 min. as claimed in the instant claim in order to carry out nitriding in a stable atmosphere (col.3, lines 9-13 of '542). See MPEP 2144.05 II.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over '147 in view '542 and further in view of Kokubu (JP 62-270761, thereafter, 'JP761) and Kitano Kenzo et al (JP 2000-087214, thereafter 'JP214).

Regarding claim 5, '147 in view of '542 does not explicitly state, changing nitriding gas during the nitriding process; nitriding with first mixed gas consisting of 50 to 90% by volume of ammonia, 0.1 to 0.9% by volume of oxygen and balanced by substantially nitrogen; and after one third to one half of the processing time, replacing nitriding gas to 0 to 25% by volume ammonia with balanced with nitrogen. However, changing nitridding gas, adding oxygen in mixture of ammonia and nitrogen gas, and designing the ammonia percentage in the nitriding gas are result-effective variables in term of thickness and uniformity of resulting nitriding layers, which are evidenced by 'JP761. 'JP761 teaches changing nitriding gas atmosphere during a nitriding process, for example, using different nitriding gas atmosphere in nitriding periods 3 to 7 (Fig.2 of 'JP761). 'JP761 teaches the nitriding gas is comprised of ammonia, oxygen and nitrogen. The content of ammonia is 40 to 60 Vol.% and the contents of oxygen is 0.2-3 Vol.% (Abstract of 'JP761), which overlaps the first mixing gas (ammonia, oxygen and nitrogen) ranges as claimed in the instant claim 5. Therefore, it would have been obvious to one skilled in the art to change nitriding gas atmosphere during nitriding process; to adjust the time period of different nitriding steps; and to choose first mixing

gas consisting of 50 to 90% by volume of ammonia, 0.1 to 0.9% by volume of oxygen and balanced by substantially nitrogen as claimed in the instant claim as demonstrated in 'JP761 in process of '147) in order to obtain desired surface hardness and hardness distribution of nitriding layers (Abstract of 'JP761). See MPEP 2144.05 II. Regarding the second mixture of nitriding gas, 'JP214 teaches a method to form a hard nitriding hardened layer on the surface of maraging steel (Abstract of 'JP214). 'JP214 teaches the concentration of NH_3 in a nitriding atmosphere is in the range 5 to 30% by vol., which overlaps the range of nitriding gas consisting 0 to 25% by volume ammonia as claimed in the instant claim 5. 'JP214 teaches the similar coated fluoride film and nitriding process on the same maraging steel at the similar temperature (400 to 500°C) for the similar nitriding time (15 min. to 5 hrs.) as disclosed in the instant invention. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the nitriding with a second nitriding gas with 0 to 25% by volume ammonia as demonstrated by 'JP214 in '147's process in view of 'JP761, because 'JP214 teaches the steel's property of high fatigue strength and wear resistance can be obtained by such a nitriding process (Abstract of 'JP761).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over '147 in view of '542, 'JP761 and 'JP214, and further in view of Dawes et al (US 4,904,316, thereafter '316).

Regarding claim 6, '147 in view of '542, 'JP761 and 'JP214 do not explicitly state using 0.5 to 4.5 Vol.% air to replace 0.1 to 0.9% by volume of oxygen in the first mixture of nitriding gas. However, air is a functional equivalent to oxygen in term of oxidation effect as a nitriding gas, which is evidenced by '316. '316 teaches the nitriding gaseous atmosphere may be made up of ammonia with an addition of air or oxygen or a gas mixture of endothermic gas or exothermic gas. The content of oxygen may be up to about 3% by volume (Col.3, lines 1-10). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute air for oxygen as disclosed by '316, because air and oxygen would be functional equivalents for oxidation effect in gas nitriding process as evidenced by '316. See MPEP 2144.06.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jie Yang whose telephone number is 571-2701884. The examiner can normally be reached on IFP.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-2721244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JY

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